FIG. 1A

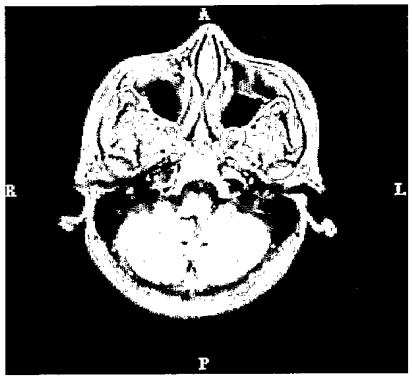

FIG. 1B

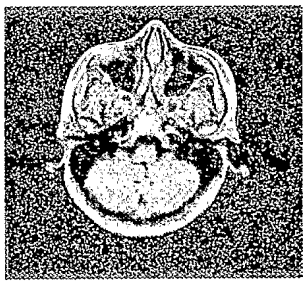

FIG. 2

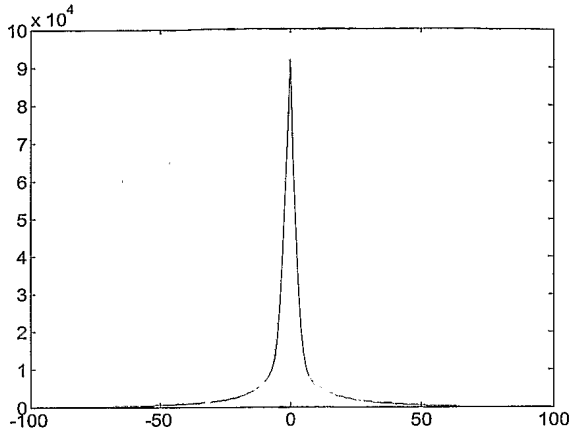
x 10^4
10
9
8
7
6
5
4
3
2
1
0
-100
-50
0
50
100

FIG. 3

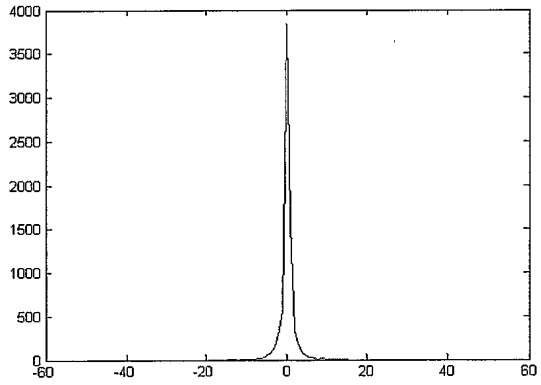
4000
3500
3000
2500
2000
1500
1000
500
0
-60
-40
-20
0
20
40
60

FIG. 4

$$\begin{pmatrix} 0 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 1 & 1 & \cdots & 1 & 1 & 0 \\ 0 & 1 & 1 & \cdots & 1 & 1 & 0 \\ \vdots & \vdots & \vdots & & \vdots & \vdots & \vdots \\ 0 & 1 & 1 & \cdots & 1 & 1 & 0 \\ 0 & 1 & 1 & \cdots & 1 & 1 & 0 \\ 0 & 0 & 0 & \cdots & 0 & 0 & 0 \end{pmatrix}$$

FIG. 5A

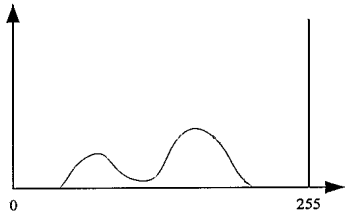

FIG 5B

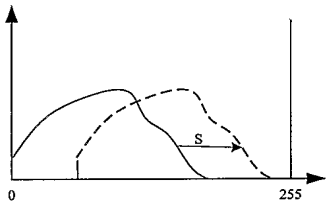

FIG. 5C

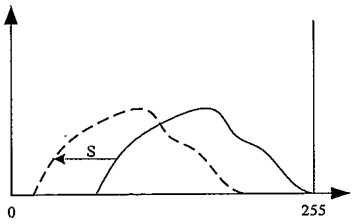

FIG. 5D

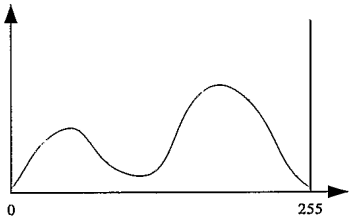

FIG. 6

5/3 FILTER COEFFICIENTS

	Analysis Filter Coefficients		Synthesis Filter Coefficients	
i	Low-pass Filter $h_L(i)$	High-pass Filter $h_H(i)$	Low-pass Filter $g_L(i)$	High-pass Filter $g_H(i)$
0	6/8	1	1	6/8
±1	2/8	-1/2	1/2	-2/8
±2	-1/8	0	0	-1/8

FIG. 7

$$G_{HL} = \begin{bmatrix} -\frac{1}{16} & -\frac{1}{8} & \frac{3}{8} & -\frac{1}{8} & -\frac{1}{16} \\ -\frac{1}{8} & -\frac{2}{8} & \frac{6}{8} & -\frac{2}{8} & -\frac{1}{8} \\ -\frac{1}{16} & -\frac{1}{8} & \frac{3}{8} & -\frac{1}{8} & -\frac{1}{16} \end{bmatrix}$$

FIG. 8

$$G_{LH} = \begin{bmatrix} -\frac{1}{16} & -\frac{1}{8} & -\frac{1}{16} \\ -\frac{1}{8} & -\frac{2}{8} & -\frac{1}{8} \\ \frac{3}{8} & \frac{6}{8} & \frac{3}{8} \\ -\frac{1}{8} & -\frac{2}{8} & -\frac{1}{8} \\ -\frac{1}{16} & -\frac{1}{8} & -\frac{1}{16} \end{bmatrix}$$

FIG. 9

$$G_{LL} = \begin{bmatrix} \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & 1 & \frac{1}{2} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}$$

FIG. 10

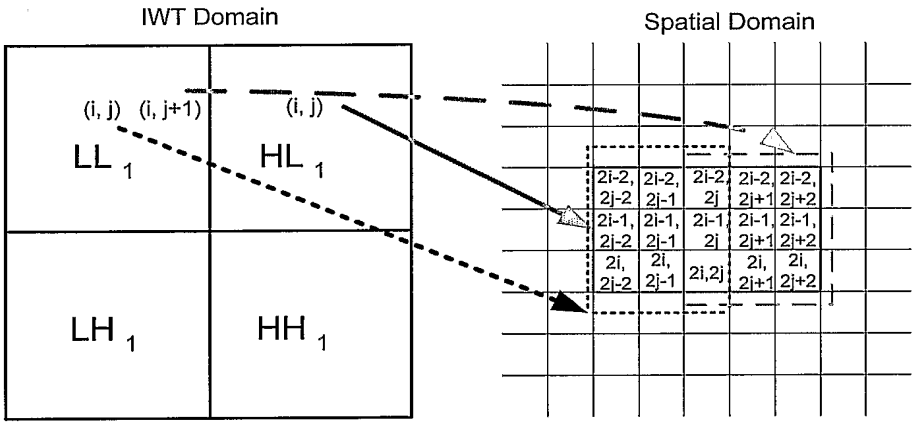

FIG. 11

$$R = \begin{bmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 & 0 \end{bmatrix}$$

FIG. 12

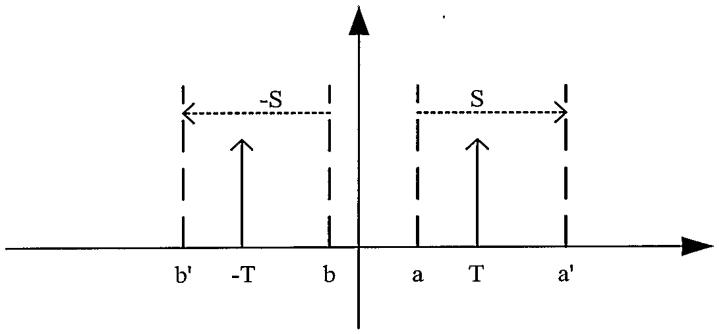

FIG 13

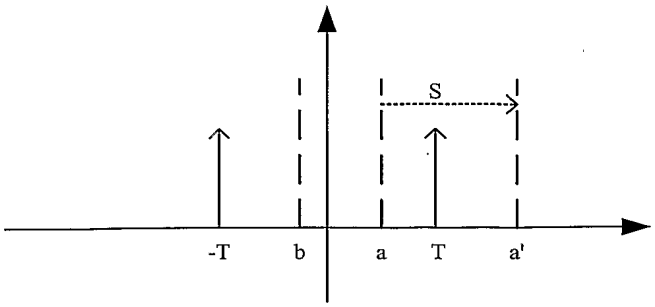

FIG. 14

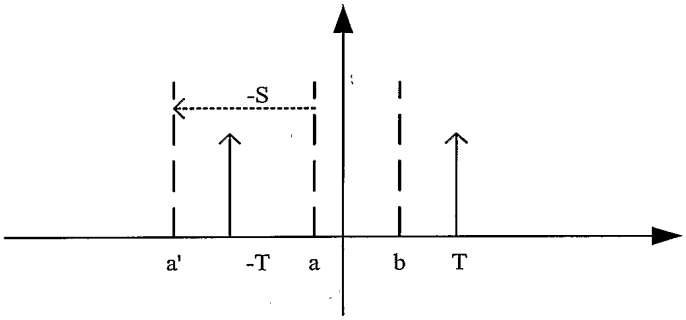

FIG. 15

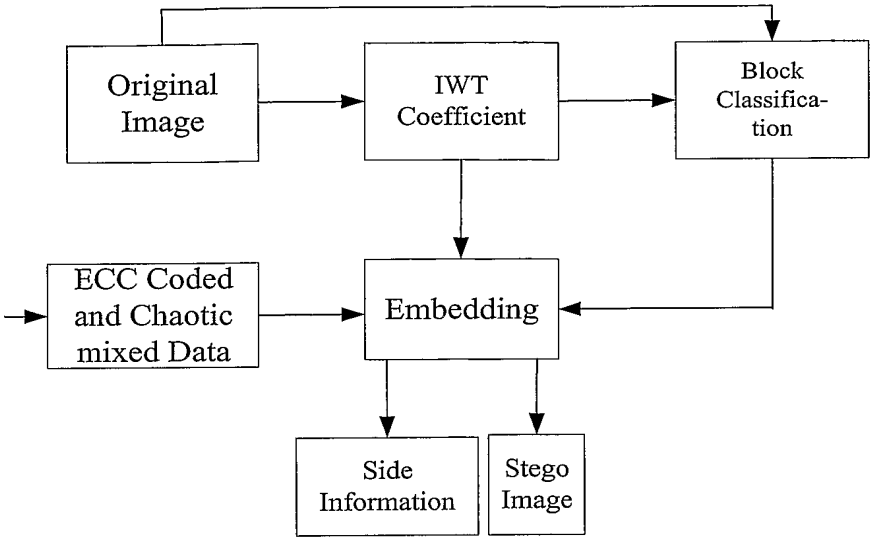
Original Image
IWT Coefficient
Block Classifica-tion
ECC Coded and Chaotic mixed Data
Embedding
Side Information
Stego Image

FIG. 16

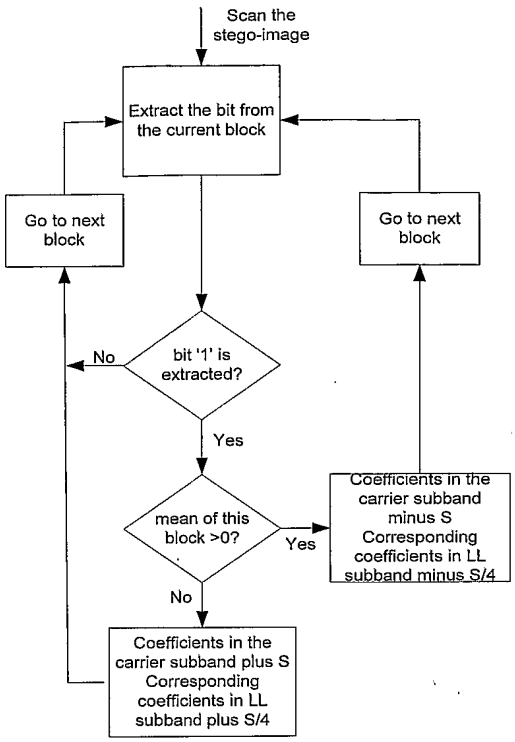

FIG. 17

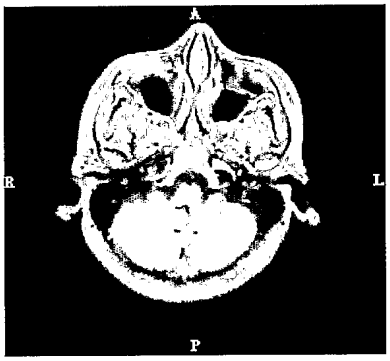

FIG. 18

FIG. 19

Block size	ECC Scheme	Capacity with ECC (bits)	Capacity without ECC (bits)
5	(15,11)	1907	2601
6	(15,11)	1293	1764
7	(15,11)	950	1296
8	(15,11)	750	1024
9	(15,11)	574	784
10	(15,11)	458	625
11	(15,11)	387	529
12	(15,11)	323	441

FIG. 20

Block size	m_{max} in HL_1	m_{max} in LH_1	Minimum shift values	PSNR (dB)
5	16.56	7.78	8	40.09
6	10.25	4.56	6	41.87
7	9.64	2.72	4	44.81
8	6.14	2.64	4	44.36
9	4.31	2.63	4	44.18
10	4.00	1.84	2	49.86
11	3.41	1.69	2	49.62
12	3.18	1.55	2	49.46

FIG. 21

FIG. 22

FIG. 23

PSNR(dB)		Block Size							
		5	6	7	8	9	10	11	12
Shift Value	2	-	-	-	-	-	49.86	49.62	49.46
	4	-	-	44.81	44.36	44.18	44.08	43.80	43.63
	6	-	41.87	41.30	40.84	40.67	40.55	40.28	40.12
	8	40.09	39.44	38.85	38.39	38.20	38.10	37.83	37.66
	10	38.14	37.48	36.89	36.43	36.26	36.15	35.88	35.71
	12	36.57	35.91	35.32	34.86	34.68	34.57	34.30	34.14
	14	35.23	34.57	33.98	33.52	33.34	33.23	32.96	32.79
	16	34.08	33.42	32.83	32.37	32.18	32.08	31.81	31.64
	18	33.05	32.38	31.80	31.34	31.16	31.05	30.78	30.61
	20	32.13	31.47	30.89	30.43	30.24	30.15	29.86	29.70

FIG. 24

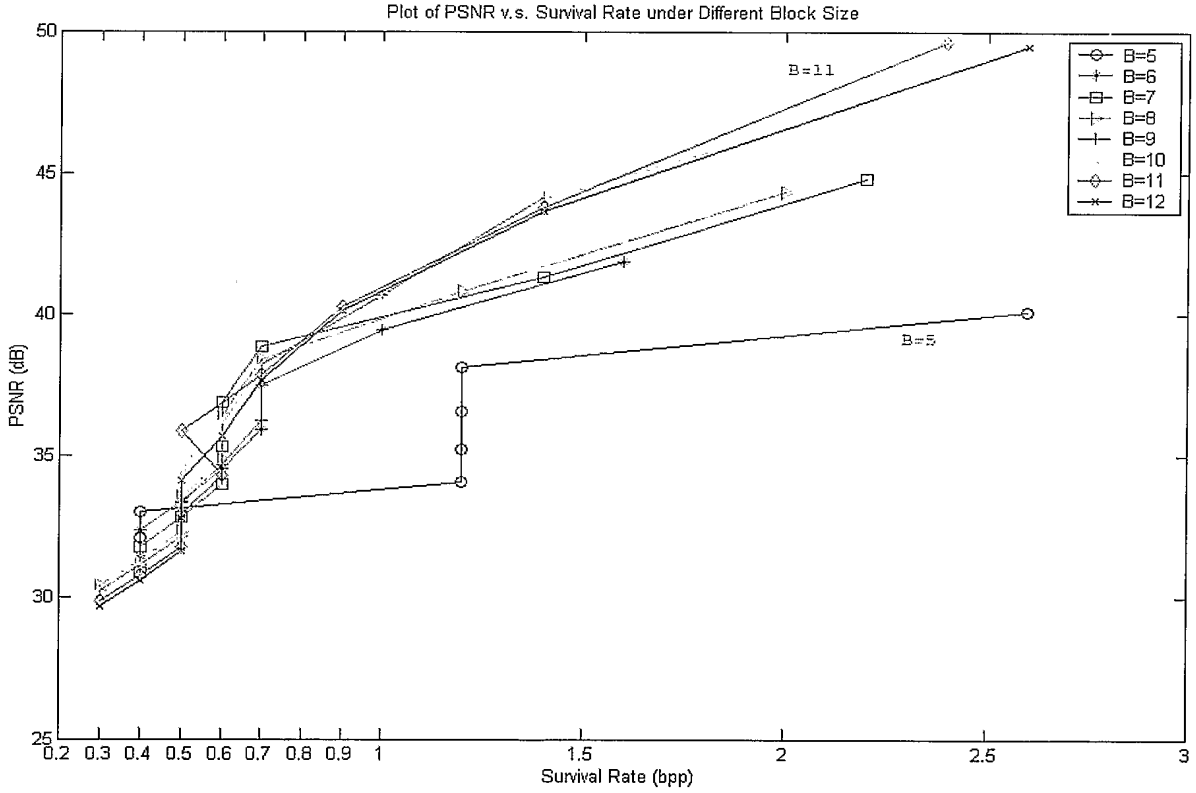

FIG. 25

Decoded error bits		Block Size							
		5	6	7	8	9	10	11	12
Shift Value	2	-	-	-	-	-	228	197	164
	4	-	-	477	383	291	228	197	164
	6	-	643	474	381	275	167	154	131
	8	940	643	359	262	203	91	70	78
	10	940	616	237	160	136	50	37	10
	12	940	485	129	89	79	13	7	0
	14	940	398	82	32	35	0	0	0
	16	940	269	40	14	16	0	0	0
	18	938	199	28	2	11	0	0	0
	20	747	128	11	1	10	0	0	0

FIG. 26

Decoded error bits		Block Size							
		5	6	7	8	9	10	11	12
Shift Value	2	-	-	-	-	-	140	137	121
	4	-	-	200	120	46	27	10	0
	6	-	313	111	32	8	4	0	0
	8	657	236	87	18	3	0	0	0
	10	312	159	19	9	0	0	0	0
	12	46	28	4	2	0	0	0	0
	14	14	6	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0